

EVALUATING THE ROLE OF GRASSLAND FIRE
IN THE SOUTHWEST COMMUNITIES AND FIRE
PRACTICES, PERCEPTIONS, AND PREFERENCES
HISTORICAL BACKGROUND
Documented Uses of Fire in Prehistoric
and Historic New Mexico

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Documented Uses of Fire in Prehistoric and Historic New Mexico

by

Carol J. Condie
Quivira Research Associates
1809 Notre Dame NE
Albuquerque, New Mexico 87106
(505) 255-9264

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Carol B. Raish
USDA Forest Service
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COMMUNITIES AND FIRE: PRACTICES, PERCEPTIONS, AND PREFERENCES HISTORICAL BACKGROUND

Documented Uses of Fire in Prehistoric and Historic New Mexico

I. Geographic, Ethnic, and Data Constraints

Because the project focus is the grasslands of the Southwestern Steppe, Colorado Plateau, and Chihuahuan Desert, the geographic area initially included New Mexico and portions of Texas, Oklahoma, and Arizona. Groups to be included were the Eastern and Western Pueblos, Apache, Navajo, Comanche, Ute, Kiowa, Hispanic, and Anglo, and “any other groups deemed appropriate by the researchers....” We added the Cheyenne/Arapaho, Southern Paiute, and the Manso-Suma-Jano-Jocome—and, accordingly, expanded the geographic area slightly.

When we began reviewing publications, it quickly became apparent that massive amounts of information existed on natural fire and that several types of deliberately set fires were recorded in the literature. We needed to place constraints on what constitutes fire “use,” and adopted the convention that fires had to be kindled intentionally toward specific ends that result in ecological changes. Cooking fires, roasting pits, hornos, parching coals, camp fires, council fires, ceremonial fires, tobacco pipes, and cigarettes don’t qualify. (In some cases, of course, one of these fires may have escaped and resulted in a fire that had ecological consequences.) In addition to fires that constituted significant use, we have also included a section on fire use that didn’t fall into our “disqualified” category, but that presumably had limited ecological effects.

II. Methodology

We queried approximately 20 individuals and organizations who we thought might have information we would not otherwise encounter. We also searched several bibliographies (e.g., Adams, in press; Ethnographic Bibliography of North America (Murdock 1960); the Human Relations Area Files (almost useless); Correll, Watson, and Brugge (1969); Dobyns and Euler

(1980); Melody (1977); Parmenter (1999); and Williams (2001b). We also searched the reference sections of various publications as we reviewed them.

We read, reviewed, or skimmed between 400 and 500 ethnographic and historic sources. We usually did not read lengthy sources word for word, but relied on indices when they appeared to be comprehensive. When a book lacked an index, we tried to read the most promising sections—such as agriculture, hunting, warfare, etc. We attempted to locate—and read thoroughly—all of the ethnographic, ethnobotanical, ethnozoological, enthoentomological, and ethnobiological sources that relate to the study area. We also searched for early autobiographies and travel diaries.

We found no fire information for the Cheyenne/Arapaho or the Kiowa, but identified at least two uses of fire for all of the other groups. To some extent, our failure to find information is a sampling problem. We read enormous numbers of publications on the Pueblos, Apaches, and Navajos and were fortunate to be able to interview researchers working on prehistoric fire use projects not yet published. We found far fewer references for the other groups, in some cases because we did not exert the heroic efforts to follow out leads that we did for the major New Mexico groups and in other cases (e.g., Manso, etc.) because very little literature exists. Another factor is undoubtedly that we know the New Mexico literature better than we do for some of the other groups. Finally, it was simpler for us to identify and interview local scholars who have research projects in progress than to find people working on non-New Mexico groups. There still remain a few sources that we know about but have been unable to access. We believe, however, that we have reached the point of diminishing returns and the delinquent references probably contain very little new and unsuspected information.

III. Documented Uses of Fire

A. Clearing land

1. Prehistoric

a. The Dolores Archaeological Project yielded fairly convincing evidence for prehistoric use of fire for clearing fields. Petersen (1985:238; Petersen and Matthews 1987:7) found high percentages of corn pollen and charcoal in one pollen profile dating to the A.D. 600s from the marsh at Sagehen Flats. The implications are that a corn field existed adjacent to the marsh and that fire might have been used by the early Anasazi to clear land.

2. Pueblo

a. "When a young Zuni wishes to add to his landed possessions...he cuts away the sagebrushes with his heavy hoe, and clods of grass, weeds, etc., all of which he heaps in the middle of the field and burns" (Cushing 1974:152-153).

b. In preparing fields at Santa Clara Pueblo, people either pulled weeds or burned them (Hill 1982:27).

3. Apache

a. Opler (1936:206) notes that among the Jicarilla, "Fields were cleared by burning the grass and brush...." Further, cornfields were prepared by pulling bushes, weeds, and tall grass and by burning (Opler 1971:233).

b. Grenville Goodwin reported (Opler 1973:44) that trees were burned out of fields, if possible, when the fields were cleared of brush.

c. "Apaches in the Southwest commonly used fire...to clear brushy or forested areas around camps to prevent concealment of their enemies,..." (Scurlock 1998:269)

e. See Entry A.4.a, below.

4. Navajo

a. “Apaches, Navajos, and other native groups [along the Middle Pecos]...started ‘prescribed burns’ for...clearing woodlands....” Scurlock and Parsons (2001:21)

b. Hill (1938:24) notes that Navajos “burned over [fields] to remove as much brush and tree growth as possible.”

5. Cheyenne/Arapaho—No information found.

6. Comanche—No information found.

7. Kiowa—No information found.

8. Ute—No information found.

9. Southern Paiute

a. Kaibab burned brush to clear fields (Kelly 1964:40).

10. Manso/Suma/Jocomo/Jano—No information found.

11. Hispanic/Anglo

a. “The Spaniards...used fires to clear timbered land for farming or livestock grazing” (Scurlock and Parsons 2001:21; also, Allen [1984] and Ebright [1994], cited in Scurlock [1998]). Scurlock (1999:91) remarks “Spaniards used fire as one method of clearing the *bosque* for cultivation....[and they] also burned...plant communities to create ‘pasture’ for their livestock.”

b. Jones (1932:274) reported that L.F. Cottam, Assistant Forest Supervisor for the Santa Fe National Forest, said the Spanish never cut a lot of timber, but “burned a great deal to make grazing land and to force out game.”

c. Allen (2001:19) remarks “Third-generation shepherd Leandro Salazar recalled his father telling of fires set by shepherds to enlarge pastures in the northeastern Jemez Mountains in the late 1800s that created meadows still present today (Allen 1984:131-132).”

B. Stimulate shoot formation/encourage new growth

1. Prehistoric

a. Dunmire and Tierney (1995:138-139) believe prehistoric Pueblos may have set threeleaf sumac (Rhus trilobata) bushes on fire to stimulate shoot formation (for basketry, cradleboards, arrowshafts and other implements). They note the plant’s affinity for prehistoric fields.

b. Bohrer (1983) combines several kinds of evidence to infer prehistoric burning of Rhus trilobata. She remarks (p. 122): “To one familiar with the typical complex branching habit of squawbush, the widespread use of the stems in historic Southwestern Indian basketry...seems incomprehensible.” Enlightenment came when she found, one autumn, a patch of sumac that had burned to the ground and discovered, the following spring, that the patch bore “vigorous straight new shoots.” Noting that many of the famous Late Archaic split-twig animal figurines from the Grand Canyon and southern Utah were made from sumac (one from the Grand Canyon containing a shoot more than 6 ft long) and reviewing the numerous references to spiritual personifications of fire in Pueblo prayers, legends, and ceremonies, Bohrer concludes:

The use of the straight shoots of squawbush for split-twig figurines in the Late Archaic provides suggestive evidence of the long use of fire to manipulate vegetation in the Southwest. Although our knowledge of formalized burning practices among Pueblo agriculturalists has been preserved erratically, an attitude toward fire as a fertile force still persists in ritual contexts.

(In a follow-up article, Bohrer [1992] reviews pollen and macrobotanical evidence for Hohokam burning—outside our area of interest, but instructive for future archeobotanical studies in New Mexico.)

c. A study by Richard Periman (2001) seems worth reviewing at length here. He conducted an intensive study of a restricted landscape in an attempt to identify human-influenced changes that occurred from 5500 B.C. to A.D. 1900. The study area consists of two miles of the Rio del Oso beginning at a point three miles before it debouches into the Chama River at the town of Chili (roughly midway between Española and Abiquiu, NM on U.S. 84). Three highly stratified cutbank areas exposed by severe downcutting of the river allowed a comprehensive look at the last 7000 years of the area's history. Periman and his colleagues collected data on all aspects of the region's paleoecology (geology, climate, geomorphology, ancient and modern pollen, soils, fluvial regimes, etc.) and combined this information with changing land use practices during the prehistoric Archaic and Anasazi periods and the historic Spanish/Mexican and American periods.

One of the data sets he included was past fire regimes. The conventional assumption for such studies is that fine charcoal in a soil profile indicates a landscape fire (the charcoal having blown into the discovery location) and that larger chunks indicate a local fire (the charcoal being more or less in situ) (p. 199).

It appears that a grassland with scattered junipers (four trees to less than one tree/acre) prevailed in the study area during the Archaic period (5500 B.C.—A.D. 600) and that, even though burning took place throughout the entire Archaic, frequent burning on a landscape scale occurred during the late Archaic (pp. 198-199). Remarking on the large variety of resources that would have been available from the riparian area to high elevations, Periman notes (p. 201):

“This highly productive ecosystem would have been intensively managed by the valley occupants, through burning, pruning, and selective harvest.”

Fire in the valley decreased during the A.D. 400-1600 period, although the Anasazi burned upland areas. Periman believes that since they required wood for heat, cooking, and pottery firing, they would not have set fire to their nearest mesa and mountain sources of fuel wood—nor would they have burned the grasslands surrounding their villages and farms. Lack of burning allowed juniper densities in the grassland to increase from one tree/acre ca. A.D. 1100 to five trees/acre at A.D. 1600. (Pp. 206, 208)

Fire dropped dramatically during the Spanish/Mexican period (A.D. 1700-1846). The village of Rancho Rio Oso was built on the ruins of the prehistoric Pueblo site of Pesedeouinge. The fields lay along the river, but the uplands and mountains constituted a commons for grazing, wood harvesting, and hunting. Juniper density increased to more than 20 trees/acre during the Spanish period. (Pp. 21-211)

The period of A.D. 1846-1900, the American period, is poorly reflected in the paleoecological data in the study area, but Periman notes (pp. 216-217) the explosion in sheep and cattle grazing to supply the California gold mining and U.S. military markets. “This grazing frenzy,” as Periman puts it (p. 217), “caused massive decreases in vegetation cover, plant vigor, and [encouraged] suppression of natural fires.” He continues (p. 241): “The unprecedented levels of overstocking by American commercial ranchers, from the 1840s through the ecological collapse of the 1880s, accelerated any erosion that had begun with Hispanic grazing. By the turn of the twentieth century, the formerly verdant Rio del Oso valley began to resemble a series of arroyos, the rains of summer thunder storms moving quickly from the valley, the floodplain retaining little moisture.”

2. Pueblo—No information found.

3. Apache

a. “Both the Cibecue and the White Mountain burned trees (probably willow and sumac) to bring out the young shoots desired for basket making” (Buskirk 1986: 165-166).

b. See B.6.a, below.

4. Navajo—No information found.

5. Cheyenne/Arapaho—No information found.

6. Comanche

a. “Apaches, Comanches, and probably the Suma and Manso, burned grasslands and upland shrublands, woodlands or forests in the area...to stimulate new plant growth” (Scurlock 1999:91).

7. Kiowa—No information found.

8. Ute—No information found.

9. Southern Paiute—No information found.

10. Manso/Suma/Jocome/Jano

a. See B.6.a, above.

11. Hispanic/Anglo

a. “The Spaniards [in the Middle Pecos area] also used fires to enhance growth of denser, taller plants....” (Scurlock and Parsons 2001:21)

C. Encourage new grass

1. Prehistoric—No information found.

2. Pueblo

a. Taos people were reported as setting fire to grass in spring to encourage new growth (Brugge and Gerow 2000:475, quoting Dominguez 1776 [Adams and Chavez 1956]).

3. Apache

a. In assessing the role of fire in the evolution of grasslands, Bahre (1985) uses reports of southeastern Arizona and southwestern New Mexico wildfires in Arizona newspapers between 1859 and 1890 to attempt to evaluate the frequency, areal extent, and causative agents. His abstract bears quoting in full:

Local newspaper accounts of wildfires in southeastern Arizona between 1859 and 1890 demonstrate that during that period, 1) wildfires were much larger in areal extent, especially in the grasslands, than they are at present; 2) the occurrence of large grassland fires declined after 1882, probably as a result of overgrazing; 3) the cessation of major grassland fires preceded the “brush invasion” of the 1890s; 4) Amerinds, especially the Apaches, set wildfires; 5) wildfire suppression was favored by the early Anglo settlers; 6) wildfires occurred in all of the major vegetation communities, including desert scrub; and 7) wildfires were fairly frequent (Bahre 1985:190).

4. Navajo—No information found.

5. Cheyenne/Arapaho—No information found.

6. Comanche—No information found.

7. Kiowa—No information found.

8. Ute—No information found.

9. Southern Paiute—No information found.

10. Manso/Suma/Jocome/Jano—No information found.

11. Hispanic/Anglo

a. Gibson (1967:150) remarks that ranchers in eastern New Mexico, western Oklahoma, and western Texas set grass fires “accidentally or deliberately” (presumably to increase grass).

b. In southeast New Mexico, some cattle ranchers burned rangelands to stimulate new grass (Pratt and Scurlock 1989:100).

c. "Ranchers who first settled Texas and southern New Mexico continued to burn off their pastures, for they recognized that burning produced rich, tender grass in clean pastures" Stewart (1955a:63). (See G.11.b, below.)

12. Unspecified Plains groups

a. Stewart (1955a:59) quotes Catlin as saying Indians burned to create fresh crop of grass and make passage easier for people and horses the next year.

b. McHugh (1972:70) quotes Lewis and Clark: "...It is Said to be common for the Indians to burn the Plains near their Villages every Spring for the benefit of their horses, and to induce the Buffalow to come near to them." He adds (p. 71) that Plains Indians had strict laws against burning in areas of sparse, short grass, because the initial increase in forage would be followed by a decrease in over-all yield.

D. Replenish soil nutrients

1. Prehistoric—No information found.

2. Pueblo

a. "...In historic times Sia farmers applied wood ash to their fields for fertilization. When corn plants were one to one and one-half feet high, the ash was placed around each plant. Clayey soil was then piled to a depth of six inches around this to hold moisture and ash to the plant, and also to permit the nodular roots of the corn to branch out." (Euler 1954:29)

3. Apache

a. "Apaches...commonly used fire...to removed stubble in fields and produce nutrient-rich ashes" (Scurlock 1998:269).

b. "A White Mountain man stated that his people used to burn the grama grass on a field because the ashes were good for corn," but weeds and cornstalks were burned at the edge of the field and ashes were not scattered on the field (Buskirk 1986:25, 61).

4. Navajo—No information found.

5. Cheyenne/Arapaho—No information found.

6. Comanche—No information found.

7. Kiowa—No information found.

8. Ute—No information found.

9. Southern Paiute—No information found.

10. Manso/Suma/Jocomo/Jano—No information found.

11. Hispanic/Anglo—No information found.

E. Increase seed production

1. Prehistoric—No information found.

2. Pueblo

a. Zuni burned patches to improve seed production (Gifford 1940:14).

3. Apache

a. White Mountain, Chiricahua, and Warm Springs burned patches to improve seed production (Gifford 1940:14).

4. Navajo

- a. The northwestern Navajo burned to improve wild seed production

(Stewart 1942:251).

- 5. Cheyenne/Arapaho—No information found.

- 6. Comanche—No information found.

- 7. Kiowa—No information found.

- 8. Ute

- a. Stewart (1942:251) reports that the Ute Mountain Ute burned to improve wild seeds.

- 9. Southern Paiute—No information found.

- 10. Manso/Suma/Jocome/Jano—No information found.

- 11. Hispanic/Anglo—No information found.

F. Improve tobacco

- 1. Prehistoric

- a. Adams and Toll (2000:144-145) believe burning is necessary to keep tobacco growing and note the response of Nicotiana attenuata to a lightning-set fire in southwestern Colorado. During the first summer after the burn, 86 tobacco plants were present in the burned area, but by the third summer tobacco presence had dwindled to zero. They record the recovery of tobacco remains from archeological sites in New Mexico and adjacent areas of Colorado and Arizona: Archaic and Basketmaker = 31 sites (p. 153); Pueblo I (A.D. 750-950) = 28 sites (p. 156); Pueblo II-III (A.D. 950-1250) = 62 sites (p. 159); Pueblo IV (A.D. 1250-1540) = 11 sites (p. 164). The implication is that prehistoric people fired tobacco patches to encourage growth.

- 2. Pueblo—No information found.

3. Apache

a. "...Among the [Western Apache] patches of wild tobacco were burned over." (Buskirk 1986:165-166)

b. The Jicarillas cleared tobacco fields, burned them over, and irrigated about 10 days prior to planting seed (Opler 1971:327).

4. Navajo

c. Stewart (1942:251) reports both purposeful burning and the recognition that burning improved tobacco for the northwestern Navajo.

5. Cheyenne/Arapaho—No information found.

6. Comanche—No information found.

7. Kiowa—No information found.

8. Ute

a. Stewart (1942) lists the Southern Ute and Ute Mountain Ute among groups that recognized that tobacco grows best in burned areas and notes that the Ute Mountain Ute deliberately burned tobacco plots and recognized the burner of the plot as the owner (pp. 251, 300).

9. Southern Paiute

a. Kaibab, San Juan, and Panguitch bands burned tobacco (Nicotiana attenuata) plots in fall; next spring, tobacco grew plentifully (Kelly 1964:46, 171, 180).

b. "Burning to increase natural yields of tobacco (Nicotiana attenuata, N. bigelovii) is the best attested procedure among all [Great Basin] groups.... In areas where it appears not to have been practiced, groups nonetheless recognized the association between

tobacco yields and fires, frequenting naturally burned areas to harvest the plants” (Fowler 1986:93).

c. Stewart (1942:251) records both the recognition of the efficacy of burning and purposeful burning for the Kaibab and San Juan bands.

10. Manso/Suma/Jocome/Jano—No information found.

11. Hispanic/Anglo—No information found.

G. Kill mesquite and other woody invaders

1. Prehistoric—No information found.

2. Pueblo—No information found.

3. Apache—No information found.

4. Navajo—No information found.

5. Cheyenne/Arapaho—No information found.

6. Comanche—No information found.

7. Kiowa—No information found.

8. Ute—No information found.

9. Southern Paiute—No information found.

10. Manso/Suma/Jocome/Jano—No information found.

11. Hispanic/Anglo

a. Some cattle ranchers in southeast New Mexico burned rangelands to kill mesquite and other woody invaders (Pratt and Scurlock 1989:100).

b. Stewart (1955a:63) remarks “Ranchers who first settled Texas and southern New Mexico continued to burn off their pastures, for they recognized that burning produced rich, tender grass in clean pastures.” He goes on to observe that when pastures are

overgrazed grass is inadequate to make fires hot enough to kill mesquite shoots, the result being that mesquite takes over.

H. Increase precipitation

1. Prehistoric—No information found.

2. Pueblo—No information found.

3. Apache

a. Cooper (1960:138) remarks: "On his trip through the Indian reservation [one of the Western Apache groups], Webb (1900) found fires burning in two places, which he said were 'attributable to the Indians who believe fire and smoke bring rain.'" Cooper (1960:138) also quotes Holsinger (1902) as remarking on the Apaches' "...well-grounded superstition that forest fires cause rain...."

b. "They [Apaches] also believed that burning caused precipitation" (Scurlock 1998:269).

4. Navajo—No information found.

5. Cheyenne/Arapaho—No information found.

6. Comanche—No information found.

7. Kiowa—No information found.

8. Ute—No information found.

9. Southern Paiute—No information found.

10. Manso/Suma/Jocome/Jano—No information found.

11. Hispanic/Anglo

a. In southeast New Mexico, Anglos burned grasslands to increase precipitation (Pratt and Scurlock 1989:93).

I. Game drives

1. Prehistoric

a. For a couple of decades (1940s-1960s) arguments raged over the possibility that large and frequent fire drives had caused the extinction of Late Pleistocene fauna. The notion has subsided and will not be further discussed here, but see Sauer (1944), Eiseley (1946), and Wedel (1961) for samples of the discussion.

2. Pueblo

a. The Sanikyaq of Zuni held four rabbit drives each year. A signal fire was set and brush was lighted in a circle around the hunt ground, the smoke representing clouds. The hunters advanced to the center, closing in on the rabbits. (Curtis 1926:149)

b. Gifford (1940:7) reports fire drives (for deer and antelope) at Zuni and Santa Ana.

3. Apache

a. "In summer on suitable terrain, fire was used as an aid, a large segment of a circle being fired while a line of men closed off the unfired gap. Rabbits were killed with arrows or with yucca-stalk clubs about six feet long. One informant stated that a fire circle might be a mile in diameter; another had seen brushy level areas one-half by one-quarter of a mile in size fired." (Buskirk 1986:135-136)

b. "[Deer and pronghorn antelope] were hunted utilizing various strategies. One technique employed was to surround the deer or pronghorn on foot or horseback and drive them into a tight circle. Sometimes a fire was used to drive the animals as well. Entrapped by the fire and/or the hunters, these animals were relatively easy prey for the bow or rifle." (Pratt and Scurlock 1989:39)

c. Gifford (1940:7) reports fire drives (for unspecified game) for Western, Warm Springs, Chiricahua, and Mescalero bands.

d. Cooper (1960), citing Stevenson (1881), who conducted geological explorations in southern Colorado and northern New Mexico, says “Indians [Jicarillas?] set fire to the timber on the mountain ranges of New Mexico each fall in order to drive deer down into the canyons.”

e. Scurlock (1998:269) remarks “Apaches...commonly used fire to drive game [and] to lure insect-plagued deer to smoke....”

f. In 1796, Lieutenant Colonel Don Antonio Cordero described large Apache hunts for “deer, burro, antelope, jav[e]lina, porcupine, mountain lion [*leopardos*], bear, wolves, coyotes, hare and rabbits.” By dawn, hunters stationed over an area 12 to 15 miles in circumference would, on signal, ride toward the center setting fire to grass and shrubs as they converged. “...It takes only a moment to see the whole circle flare up. At the same instant the shouts and noise commence, the animals flee, they find no exit, and finally they fall into the hands of their astute adversaries.” This method is used only in late summer or fall when grass is dry. (Matson and Schroeder 1957:343-344)

g. Dobyns (1981:28) asserts that “Fire constituted the principal technology that Indoamericans possessed for modifying natural environments in order to augment their food supplies” and devotes 16 pages (pp. 27-43) of From Fire to Flood to a closely argued demonstration that Apaches and other Indians in the Sonoran Desert drove game with great frequency by firing the landscape. He points out (p. 28) that those who believe Indians rarely set fires “...based their conclusions on the very kind of traveler’s account least likely to

define the true frequency of Indoamerican fires” and emphasizes that Anglo-American travelers saw “...Apaches *only when the Apaches allowed themselves to be seen*” (p. 29, italics Dobyns’).

4. Navajo

a. Hill (1938:122) reports, “One of the rarer ritual methods employed in hunting deer was encircling by fire....” A large circle of grass and brush is set on fire and kept burning toward the center. When the deer cannot find an outlet, they bunch toward the center, rather than try to break through the fire ring. When the deer were killed, the fire was put out and the meat distributed. A variation of this required a large number of people, who formed a circle about eight miles in diameter and, waving cedar bark torches, moved toward the center, shooting the deer as the circle converged.

b. Navajo hunters used a similar method for rabbits. “Two or more men with cedar torches, started from the same point and ran in semi-circles lighting the grass to form a circle. The rabbits were clubbed as the fire closed in” (Hill 1938:177). Stewart (1942:242) also reports Navajos driving rabbits with a circle of fire.

c. Gifford (1940:7) reports that Eastern Navajo drove game with fire.

d. Dobyns (1981:40) reports early 20th century fire drives: “Moreover, a National Museum investigator observed that Navajos hunting in the White Mountains...burned over ‘large areas of the forests’ during their annual hunts...(Hough 1926:61).”

e. Also see I.6.a and I.9.d, below.

5. Cheyenne/Arapaho—No information found.

6. Comanche

a. "Apaches, Comanches, and probably the Suma and Manso, burned grasslands and upland shrublands, woodlands or forest in the area to drive game animals to a location where they might be more easily killed..." (Scurlock 1999:91).

7. Kiowa—No information found.

8. Ute

a. Southern Ute and Ute Mountain Ute drove deer and elk with fire (Stewart 1942:240).

b. Southern Ute and Ute Mountain Ute burned thick brush to drive rabbits out; the Southern Ute drove rabbits by circles of fire (Stewart 1942:242).

c. Southern Ute drove cicadas, crickets, and grasshoppers with a circle of fire (Stewart 1942: 245).

d. During the run-up to the Meeker massacre, Anglo settlers in Colorado claimed that the Utes "were setting fires deliberately...to drive game" (Emmitt 1954:86).

9. Southern Paiute

a. For rabbit drives, Panguitch people set up three nets in half circle. Others chased game toward nets. Brush was fired only in summer. Kaibab also might fire brush to prevent rabbits' retreat. (Kelly 1964:51, 181)

b. Stewart (1942:242) reports that the Kaibab and San Juan burned thick brush to drive rabbits out and drove rabbits via a circle of fire.

c. Small (five or six) Kaiparowits or Panguitch hunting parties might run deer or mountain sheep onto promontory and build fires behind them to cut off retreat (Kelly 1964:155-156, 181).

d. Stewart (1942:240, 241) notes that the Kaibab and San Juan used fire to drive deer and elk (and, for San Juan, antelope).

e. Cooper (1960:138) remarks that Powell (1879) "...Stated that Indians systematically set fire to the forest for the purpose of driving game. The early pioneers of Kanab, Utah, saw great clouds of smoke rolling over the Kaibab Plateau almost continuously from late spring to early fall." [Obviously, this was the Kaibab band.] In addition, Cooper (p. 138) cites McHenry (1935) and notes "It was said that Indians chased deer and other game out on the points overlooking the Grand Canyon and then set fires behind them to concentrate game on the very tips." [If this was the North Rim of the Grand Canyon, McHenry probably referred to the Shevwits and/or Kaibab Southern Paiutes; if the South Rim, Navajos would be more likely.]

10. Manso/Suma/Jocome/Jano

a. "Communal hunting was practiced employing surrounds and brush and grass fires" (Griffen 1983:332-333).

b. See I.6.a, above.

11. Hispanic/Anglo

a. Jones (1932:274) reported that L.F. Cottam, Assistant Forest Supervisor for the Santa Fe National Forest, said the Spanish never cut a lot of timber, but "burned a great deal to make grazing land and to force out game."

b. "Spaniards reportedly burned forests...to drive game" (Scurlock 1998:269, quoting Allen [1984] and Ebright [1994]).

12. Unspecified Plains groups

a. McHugh (1972:69) cites a 1683 account by Father Louis Hennepin of Indians (northern Plains?) hunting buffalo using a fire surround with one escape route for ambush, and notes (p. 245) that Indians set fires “to divert or drive buffalo.”

J. Warfare

1. Prehistoric

a. Studies on Bureau of Land Management land indicate that unidentified prehistoric people repeatedly fired Anasazi and Gallina villages in the Mesa Portales area (southwest of Cuba, NM) between ca. A.D. 1150/1175 and 1275/1300. Site density is extremely high in this area, sites ranging from hamlet size to villages of 150 rooms. Surface ceramics suggest unusual population mixes, with expected types for the area (Gallup and Chaco Black-on-white), but also Los Lunas Smudged, Socorro, McElmo, White Mountain Redwares, Kayenta wares, Gallina wares, and possible Mimbres/Mogollon utility wares. Of the 300 recorded sites over 95% have been burned by fires—many so hot the structures are vitrified. The fires seem to have been set when corn storage rooms were full, the oil in the corn apparently also explaining the immense heat—at least 2000⁰. Similar fires seem to have occurred in the Lindrith, NM area, where sites are exclusively Gallina. It is important to stress that these studies (by Lutonsky [in prep.] and Lally [in prep.]) are in the early stages, but as of today it appears that villagers in the Mesa Portales and Lindrith areas were the victims of determined and persevering enemies.

On BLM land in the Headcut Reservoir area to the south of Mesa Portales a similar situation exists. A total of 84 sites have been recorded. The sites contain either Anasazi ceramics in mixes much like the Mesa Portales sites, or Anasazi and Gallina ceramics. Thirty-four or 35 contain Chaco/McElmo Black-on-white and Gallina Black-on-white ceramics. Of

these, 83% are burned. With two exceptions, all of the burned sites contain Gallina ceramics. In addition, points with deep side notches--and exhibiting similar breakage patterns, occur only on burned sites that contain Gallina ceramics. As with the studies by Lutonsky and Lally, a paper reporting these sites is also in a preliminary stage (Shiffler [in prep.]).

2. Pueblo

a. Use of fire in prehistoric warfare continued into historic times, as the destruction of the Hopi village of Awatovi demonstrates. Because of animosities that persisted over years between Awatovi and several other of the Hopi villages, Walpi organized an attack on Awatovi on the closing night of the ceremony of Kwakwanti in November circa 1700. Special ceremonies required that all men and boys spend the night in the kivas. Just before dawn the attackers rushed the kivas, jerked the ladders up through the hatches, and flung prepared firebrands and pulverized red chile into the kivas. They continued to add fuel and to shoot arrows through the hatchways until the roofs collapsed. Apparently, no male beyond babyhood survived the attack. The women and children were distributed to other villages. (Mindeleff 1891:33-35)

3. Apache

a. "Apaches, Navajos, and other native groups [in the Middle Pecos Area]...started 'prescribed burns' for...driving away the enemy, or escaping an enemy under a screen of flames and smoke" (Scurlock and Parsons 2001:21. Also see Scurlock (1999:91).

b. Cooper (1960:138) quotes Bell (1870): "The Apaches also have a very destructive habit...of firing the forests of their enemies."

c. Kaye and Swetnam (1999) derived dendrochronological dates from 45 peel scars on 36 ponderosa pines and one white pine in the Dog Canyon area of New Mexico.

They attributed the peel scars to Mescalero Apache, who would likely have been harvesting the inner bark for emergency food or for medicinal purposes. Dog Canyon provided a safe route between the Tularosa Basin and the Sacramento Mountains and was (p. 310) "...an ideal natural fortress for the Mescalero because of its narrow defile." Comparing the peel scar dates with their reconstruction of fire history derived by dendrochronological dating of 765 fire scars between 1580 and 1915, Kaye and Swetnam found higher Mescalero presence and increased fire frequency in the Dog Canyon area from the late 1700s through the late 1800s. (The authors caution against attributing too much human influence to fire regimes.) Also see J.11.a, below.

4. Navajo

a. See Entry J.3.a, above.

5. Cheyenne/Arapaho—No information found.

6. Comanche

a. "They sometimes set fire to the grass to blot out their trail against men and dogs..." (Wallace and Hoebel 1952:266).

7. Kiowa—No information found.

8. Ute

a. In 1879 Anglo settlers in Colorado claimed that the Utes "were setting fires deliberately, to drive out the settlers and destroy the ranches of the whites..." (Emmitt 1954:86).

9. Southern Paiute—No information found.

10. Manso/Suma/Jocome/Jano—No information found.

11. Hispanic/Anglo

- a. In a study to assess Mescalero Apache fire use, Kaye and Swetnam

(1999:306) note:

In a recent study of Southwestern archival documents (more than 200 text quotations), Kaib (1998) found that about 80% of historical references to fires set by people were in the context of warfare. All of the cultures involved (i.e., Apache, Spaniards, Mexicans, and Americans) used fire against their enemies, particularly for purposes of escape, for driving the enemy out of hiding, and for burning habitations, forage, and belongings.

- b. Perhaps the most famous (or infamous) Anglo use of fire that comes to a Southwesterner's mind is Kit Carson's firing the fruit orchards and stored food in Canyon de Chelly in January of 1864—the one citadel the Navajos had thought impregnable in their strife with the U.S. Military. Utley (1984) describes the events leading to the final defeat of the Navajo and their removal to Fort Sumner (pp. 81-86) and provides extensive references in his notes (see footnotes 10 and 11, p. 280).

- c. Dobyns (1981:35) notes that colonial Spaniards set fires to burn out opposing warriors.

K. Fire uses that have limited ecological effects

1. Prehistoric—No information found.

2. Pueblo

- a. In a segment titled "Cura'tca Lights the Fires," White (1932:94-96) recounts an Acoma Corn Clan ceremony held every five years at the last of July. Fires are lit on mountain tops to the north, west, southwest, and southeast of Acoma, and six fires are lit toward McCarty's, etc. Charcoal from these fires is distributed to each Acoma household.

- b. Gifford reports (1940:6) that rodents were smudged out at Walpi, Zuni, Santa Ana, and San Ildefonso and that rodent nests were burned at Walpi and Santa Ana.

c. Hill (1982:54) reports smudging rodents at Santa Clara: "Wood rats or pack rats (xwan) were hunted by building fires and smoking them out of their nests in rock crevices."

3. Apache

a. Opler (1941:365) reports that the Chiricahuas used a smudge fire to smoke bees out of hives in trees or logs.

b. To dye yucca leaves yellow for basketry, Chiricahua weavers placed dry grass among the leaves of a yucca plant and set fire to the grass. The fire and smoke turn the leaves yellow. (Opler 1941:380-384)

c. Gifford notes (1940:6) that Western, Warm Springs, Chiricahua, Jicarilla, and Mescalero Apaches smudged rodents out of their burrows and Western Apaches burned rodent nests.

d. Western and Warm Springs Apaches used fire to cut timber (Gifford 1940:27).

e. Betzinez (1959:13) notes that Apaches used signal fires and describes method of setting them.

4. Navajo

a. Eastern Navajos smudged rodent burrows (Gifford 1940:6).

b. Eastern Navajos cut and hollowed timber by fire (Gifford 1940:27).

c. Northwestern Navajos used fire to signal hunters (Stewart 1942:240).

d. Vestal (1952:16) reports that the Ramah Navajo used fire in harvesting Indian ricegrass (*Oryzopsis hymenoides*): "...Informants knew of it as an ancient food plant. The

seeds were collected by burning the plants and then gathering the seed, hence the Navajo name ['scorched'].”

e. In a study of wild plant foods, Castetter indicates this use of fire extended beyond the Ramah Navaho. He remarks (1935:27-28):

Eriocoma cuspidata [a synonym for several Oryzopsis species—see p. 38]...has been very extensively used by...Indians...as an important source of food, especially in earlier times.... Matthews [1886] gives the Navajo name as *in-dit-lith-ee*, meaning ‘burnt off or burnt free.’ This no doubt referred to the adhering chaff which can be removed only by burning at the time the edible seeds are cleaned. The Franciscan Fathers [1910] give the word *ndidlidi* (that which is scorched) for this species, so called because the seeds were collected by holding a bunch of the grass near the fire, the seeds falling to the base of a flat stone placed near by.

f. Hocking (1956:156-157) notes the use of mullein in veterinary medicine among the Chaco Navajos: “*Verbascum thapsus* L.—mullein. The plants are ‘lighted and smoked for worms in sheep’s nose.’” Hocking remarks further “...This plant has long been known as a fumitory.”

5. Cheyenne/Arapaho—No information found.

6. Comanche—No information found.

7. Kiowa—No information found.

8. Ute

a. Southern Ute smudged rodents out of burrows (Gifford 1940:6).

b. Ute Mountain Ute signaled hunters with fire (Stewart 1942:240).

9. Southern Paiute

a. Kaibab sometimes built fire to smoke out skunks, which were hunted for sport (Kelly 1964:55).

b. Among Kaibab, eagle aeries were privately owned. Eaglets were removed when barely able to fly. Burning brush was dropped down from above or slow match

was let down on end of a net to frighten birds from the nest. They were then picked up at the base of the cliff. (Kelly 1964:92-93)

c. The Panguitch band sometimes fired woodrat nests (Kelly 1964:182).

d. San Juan used fires to signal hunters (Stewart 1942:240).

10. Manso/Suma/Jocome/Jano—No information found.

11. Hispanic/Anglo—No information found.

12. Unspecified Plains groups

a. McHugh (1972:245) reports that Indians set fires “to send messages [and] to harass inimical neighbors.”

IV. SUMMARY AND CONCLUSIONS

Fire as a subject of study has long been of interest to researchers, but studies have burgeoned in the last few decades. As a body, the compendium of fire studies is unique in springing from a wide range of scientific fields. Because of its very nature, fire has attracted both generalists and specialists in biology, hydrology, meteorology, chemistry, soil science, dendrochronology, history, and archeology. The subject also profits from the interest of numerous sub- and cross-disciplinary studies like ecology and archeo/ethno-botany. For two extensive recent bibliographies that reflect the diversity in fire studies, see Allen (2001) and Parmenter (1999).

Table 1 provides a quick summary of fire use by different ethnic groups in and adjacent to New Mexico. (In reviewing this table it is important to remember that we believe we have sampling problems for some groups [see “Methodology,” above].) Nearly all groups used fire drives, but, to judge from contemporary eye-witnesses, the Apache, Navajo, Ute, and Southern Paiute kept the forests in almost perpetual flames during the summer and fall to drive game.

(Unfortunately, none of the eye-witnesses thought to record whether the “perpetual flames” occurred during severe drought years.) Pueblo groups used fire drives, but they were more circumscribed in area and less frequent in occurrence. Burning out one’s enemies seems to be a popular military technique that apparently started prehistorically and is reported for six historic groups. Many groups used more limited and controlled fires to clear land, stimulate shoot formation, encourage new grass, increase seed production, and improve tobacco. Pueblos and Apaches used ashes to increase soil nutrients.

Table 1. Chart of fire use in and Adjacent to New Mexico by ethnic group.

	Prehistoric	Pueblo	Apache	Navajo	Cheyenne/ Arapaho	Comanche	Kiowa	Ute	Southern Paiute	Manso/Suma/ Jocomo/Jano	Hispanic/ Anglo	Totals
A. Clearing land	+	+	+	+	-	-	-	-	+	-	+	5
B. Stimulate shoot formation; encourage new growth	+	-	+	-	-	+	-	-	-	+	+	5
C. Encourage new grass*	-	+	+	-	-	-	-	-	-	-	+	3
D. Replenish soil nutrients	-	+	+	-	-	-	-	-	-	-	-	2
E. Increase seed production	-	+	+	+	-	-	-	+	-	-	-	4
F. Improve tobacco	+	-	+	+	-	-	-	+	+	-	-	5
G. Kill mesquite and other woody invaders	-	-	-	-	-	-	-	-	-	-	+	1
H. Increase precipitation	-	-	+	-	-	-	-	-	-	-	+	2
I. Game drives**	?	+	+	+	-	+	-	+	+	+	+	8
J. Warfare	+	+	+	+	-	+	-	+	-	-	+	7
K. Fire uses that have limited ecological effects***	-	+	+	+	-	-	-	+	+	-	-	5
Totals	4	7	10	6	0	3	0	5	4	2	7	

Note: + indicates trait present, but – indicates that no information was found (does not indicate trait absent).

*Unspecified Plains groups burned to encourage grass.

**Unspecified Plains groups (probably northern) hunted buffalo with a fire surround.

***Unspecified Plains groups

Apaches and Anglos believed that fire and smoke increased precipitation. Hispanics and Anglos used fire to kill mesquite and other woody invasive plants.

We catch an occasional remark in the literature that indicates people were wholly cognitive of the use of fire as a management tool and often understood the ecological results very well. Buskirk (1986:25, 61) quotes a White Mountain Apache man as saying they burned grama grass on a field to benefit the corn, but burned weeds and cornstalks at the field edge and did not scatter this ash on the field. (That more groups did not use slash-and-burn techniques may in itself be instructive, since most Southwestern soils are already high in potash, the nutrient provided by wood ashes.) McHugh (1972:71) remarks on the strict laws (among unspecified Plains Indians) against burning off sparse, short grass because of the ultimate drop in yield. These groups would probably also have anticipated Stewart's observation (1955a:63) that mesquite takes over when overgrazing leaves grass so depleted that fires cannot reach temperatures high enough to kill off mesquite shoots. It appears that fire was most often used in New Mexico as a management tool in very controlled and restricted areas. People knew the ecological effects of fire and used it judiciously for specific, limited purposes.

The argument continues between proponents of the view that, pre-fire suppression, humans were the main fire-inducing agents vs the view that natural fires were the main agent (e.g., Dobyns 1981, Kay 1994, Pyne 1995, Stewart 1955a and b). Recent useful treatments of this question are Adams (in press), Allen (2001), Fish (1996), and Swetnam and Baisan (1996:29). The argument is an unnecessary one. Deliberate burning by prehistoric and historic people in New Mexico and the Greater Southwest seems to have played a fairly minor role in land management per se. But what is of major importance is what humans did not do prior to 1900: They did not put natural fires out because they were powerless to quench them.

Attempts to understand the history, nature, and ecological effects of fire have resulted in multitudes of studies. As the studies have accumulated over the past decades, it has become

apparent that fire in the arid Southwest is influenced by a complex and ever-changing set of factors that include lightning frequencies, precipitation and humidity levels and patterns, vegetation types, fuel loads, geographic characteristics, elevation, and grazing and other anthropogenic behaviors. Although pre-1900 fire regimes differed as the relevant factors varied from one plant community to another, pre-suppression fire regimes in general were characterized by high frequency, low intensity fires. They normally did not ignite the crown because fire frequency prevented the build-up of dense fine and woody fuels that quickly lead to the raging conflagrations of the last decade. Another result of pre-1900 fire regimes was the development of “mosaic” plant communities—side-by-side burned and unburned communities that consist of a mix of species and a variety of age grades. (Adams, in press; Swetnam and Baisan 1996; Touchan, Allen, and Swetnam 1996)

Finally, it needs to be stressed that current thinking underscores the critical importance of prudence in altering fire regimes. It is clear that suppressing fires is not the answer, but neither is allowing natural fires to burn uncontrolled until they extinguish themselves. Williams (2001a:25) quotes from remarks made by Bruce Babbitt in Boise, Idaho in 1997:

To restore health, character and structure to our forests, then, the obvious first step is to bring back their own ancient predator: Wildland fire.

...At the root of the recent infernos lies a basic yet overlooked truth: We don't have a “fire problem” in the West. We have a fuels problem....We once thought all fire was evil. Now some think all fire is good. That simple mind-set doesn't work. Fire is neither good nor evil; it is a part of the natural process of change, a tool, a complex force that can be used to meet restoration goals (Babbitt 1997).

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